

D_s^\pm

$$I(J^P) = 0(0^-)$$

The angular distributions of the decays of the ϕ and $\bar{K}^*(892)^0$ in the $\phi\pi^+$ and $K^+\bar{K}^*(892)^0$ modes strongly indicate that the spin is zero. The parity given is that expected of a $c\bar{s}$ ground state.

NODE=S034

D_s^\pm MASS

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements. Measurements of the D_s^\pm mass with an error greater than 10 MeV are omitted from the fit and average. A number of early measurements have been omitted altogether.

NODE=S034M

NODE=S034M

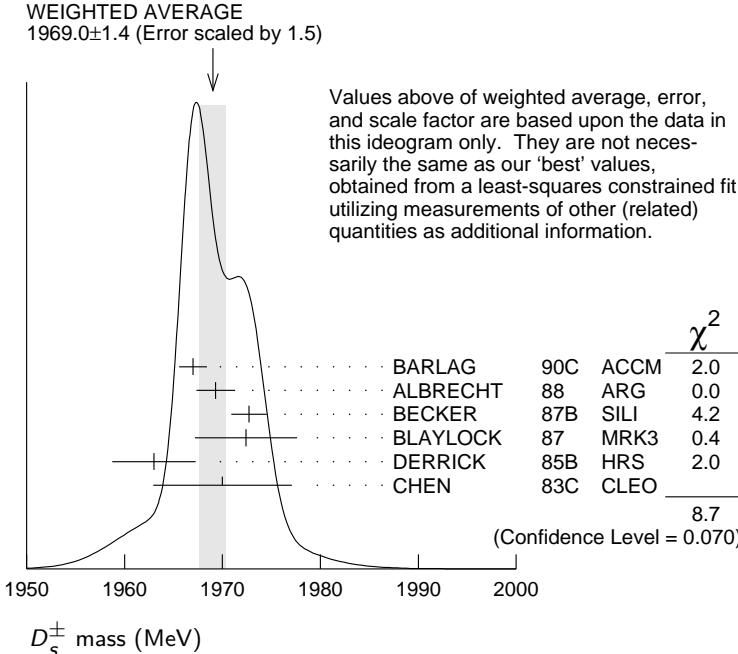
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1968.50 ± 0.32 OUR FIT	Error includes scale factor of 1.3. [1968.49 ± 0.32 MeV OUR 2012 FIT Scale factor = 1.3]			
1969.0 ± 1.4 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.			
1967.0 ± 1.0 ± 1.0	54	BARLAG	90C ACCM	π^- Cu 230 GeV
1969.3 ± 1.4 ± 1.4		ALBRECHT	88 ARG	$e^+ e^-$ 9.4–10.6 GeV
1972.7 ± 1.5 ± 1.0	21	BECKER	87B SILI	200 GeV π, K, p
1972.4 ± 3.7 ± 3.7	27	BLAYLOCK	87 MRK3	$e^+ e^-$ 4.14 GeV
1963 ± 3 ± 3	30	DERRICK	85B HRS	$e^+ e^-$ 29 GeV
1970 ± 5 ± 5	104	CHEN	83C CLEO	$e^+ e^-$ 10.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1968.3 ± 0.7 ± 0.7	290	¹ ANJOS	88 E691	Photoproduction
1980 ± 15	6	USHIDA	86 EMUL	ν wideband
1973.6 ± 2.6 ± 3.0	163	ALBRECHT	85D ARG	$e^+ e^-$ 10 GeV
1948 ± 28 ± 10	65	AIHARA	84D TPC	$e^+ e^-$ 29 GeV
1975 ± 9 ± 10	49	ALTHOFF	84 TASS	$e^+ e^-$ 14–25 GeV
1975 ± 4	3	BAILEY	84 ACCM	hadron ⁺ Be → $\phi\pi^+ X$

NODE=S034M

NEW

¹ ANJOS 88 enters the fit via $m_{D_s^\pm} - m_{D^\pm}$ (see below).

NODE=S034M;LINKAGE=D



NODE=S034DM

NODE=S034DM

$$m_{D_s^\pm} - m_{D^\pm}$$

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

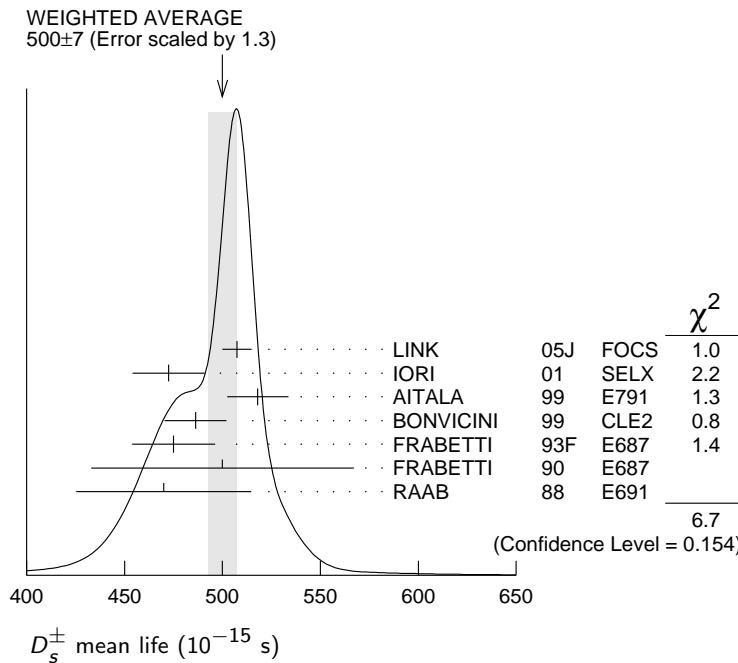
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
98.87±0.29 OUR FIT	Error includes scale factor of 1.4.			
98.85±0.25 OUR AVERAGE	Error includes scale factor of 1.1.			
99.41±0.38±0.21		ACOSTA	03D	CDF2 $\bar{p}p$, $\sqrt{s}=1.96$ TeV
98.4 ± 0.1 ± 0.3	48k	AUBERT	02G	BABR $e^+e^- \approx \Upsilon(4S)$
99.5 ± 0.6 ± 0.3		BROWN	94	CLE2 $e^+e^- \approx \Upsilon(4S)$
98.5 ± 1.5	555	CHEN	89	CLEO $e^+e^- 10.5$ GeV
99.0 ± 0.8	290	ANJOS	88	E691 Photoproduction

D_s^\pm MEAN LIFE

Measurements with an error greater than 100×10^{-15} s or with fewer than 100 events have been omitted from the Listings.

VALUE (10^{-15} s)	EVTS	DOCUMENT ID	TECN	COMMENT
500 ± 7 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.			
507.4± 5.5± 5.1	13.6k	LINK	05J	FOCS $\phi\pi^+$ and $\bar{K}^*0 K^+$
472.5±17.2± 6.6	760	IORI	01	SELX 600 GeV Σ^- , π^- , p
518 ± 14 ± 7	1662	AITALA	99	E791 π^- nucleus, 500 GeV
486.3±15.0 ± 4.9	2167	² BONVICINI	99	CLE2 $e^+e^- \approx \Upsilon(4S)$
475 ± 20 ± 7	900	FRABETTI	93F	E687 γBe , $\phi\pi^+$
500 ± 60 ± 30	104	FRABETTI	90	E687 γBe , $\phi\pi^+$
470 ± 40 ± 20	228	RAAB	88	E691 Photoproduction

² BONVICINI 99 obtains 1.19 ± 0.04 for the ratio of D_s^+ to D^0 lifetimes.



D_s^+ DECAY MODES

Unless otherwise noted, the branching fractions for modes with a resonance in the final state include all the decay modes of the resonance. D_s^- modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level

NODE=S034DM

NODE=S034T

NODE=S034T

NODE=S034T

NODE=S034T;LINKAGE=BV

NODE=S034215;NODE=S034

NODE=S034

Inclusive modes			
Γ_1	e^+ semileptonic	[a]	(6.5 ± 0.4) %
Γ_2	π^+ anything		(119.3 ± 1.4) %
Γ_3	π^- anything		(43.2 ± 0.9) %
Γ_4	π^0 anything		(123 ± 7) %
Γ_5	K^- anything		(18.7 ± 0.5) %
Γ_6	K^+ anything		(28.9 ± 0.7) %
Γ_7	K_S^0 anything		(19.0 ± 1.1) %
Γ_8	η anything	[b]	(29.9 ± 2.8) %
Γ_9	ω anything		(6.1 ± 1.4) %
Γ_{10}	η' anything	[c]	(11.7 ± 1.8) %
Γ_{11}	$f_0(980)$ anything, $f_0 \rightarrow \pi^+ \pi^-$	<	1.3 %
Γ_{12}	ϕ anything		(15.7 ± 1.0) %
Γ_{13}	$K^+ K^-$ anything		(15.8 ± 0.7) %
Γ_{14}	$K_S^0 K^+$ anything		(5.8 ± 0.5) %
Γ_{15}	$K_S^0 K^-$ anything		(1.9 ± 0.4) %
Γ_{16}	$2K_S^0$ anything		(1.70 ± 0.32) %
Γ_{17}	$2K^+$ anything	<	2.6×10^{-3}
Γ_{18}	$2K^-$ anything	<	6×10^{-4}
Leptonic and semileptonic modes			
Γ_{19}	$e^+ \nu_e$	<	1.2×10^{-4}
Γ_{20}	$\mu^+ \nu_\mu$		(5.90 ± 0.33) $\times 10^{-3}$
Γ_{21}	$\tau^+ \nu_\tau$		(5.43 ± 0.31) %
Γ_{22}	$K^+ K^- e^+ \nu_e$		—
Γ_{23}	$\phi e^+ \nu_e$	[d]	(2.49 ± 0.14) %
Γ_{24}	$\eta e^+ \nu_e + \eta'(958) e^+ \nu_e$	[d]	(3.66 ± 0.37) %
Γ_{25}	$\eta e^+ \nu_e$	[d]	(2.67 ± 0.29) %
Γ_{26}	$\eta'(958) e^+ \nu_e$	[d]	(9.9 ± 2.3) $\times 10^{-3}$
Γ_{27}	$\omega e^+ \nu_e$	[e]	< 2.0×10^{-3}
Γ_{28}	$K^0 e^+ \nu_e$		(3.7 ± 1.0) $\times 10^{-3}$
Γ_{29}	$K^*(892)^0 e^+ \nu_e$	[d]	(1.8 ± 0.7) $\times 10^{-3}$
Γ_{30}	$f_0(980) e^+ \nu_e, f_0 \rightarrow \pi^+ \pi^-$		(2.00 ± 0.32) $\times 10^{-3}$
Hadronic modes with a $K\bar{K}$ pair			
Γ_{31}	$K^+ K_S^0$		(1.48 ± 0.08) %
Γ_{32}	$K^+ K^- \pi^+$	[f]	(5.49 ± 0.27) %
Γ_{33}	$\phi \pi^+$	[d,g]	(4.5 ± 0.4) %
Γ_{34}	$\phi \pi^+, \phi \rightarrow K^+ K^-$	[g]	(2.28 ± 0.12) %
Γ_{35}	$K^+ \bar{K}^*(892)^0, \bar{K}^{*0} \rightarrow K^- \pi^+$		(2.63 ± 0.13) %
Γ_{36}	$f_0(980) \pi^+, f_0 \rightarrow K^+ K^-$		(1.16 ± 0.32) %
Γ_{37}	$f_0(1370) \pi^+, f_0 \rightarrow K^+ K^-$		(7 ± 5) $\times 10^{-4}$
Γ_{38}	$f_0(1710) \pi^+, f_0 \rightarrow K^+ K^-$		(6.7 ± 2.9) $\times 10^{-4}$
Γ_{39}	$K^+ \bar{K}_0^*(1430)^0, \bar{K}_0^* \rightarrow K^- \pi^+$		(1.9 ± 0.4) $\times 10^{-3}$
Γ_{40}	$K^0 \bar{K}^0 \pi^+$		—
Γ_{41}	$K^*(892)^+ \bar{K}^0$	[d]	(5.4 ± 1.2) %
Γ_{42}	$K^+ K^- \pi^+ \pi^0$		(5.6 ± 0.5) %
Γ_{43}	$\phi \rho^+$	[d]	(8.4 ± 1.9) %
Γ_{44}	$K_S^0 K^- 2\pi^+$		(1.64 ± 0.12) %
Γ_{45}	$K^*(892)^+ \bar{K}^*(892)^0$	[d]	(7.2 ± 2.6) %
Γ_{46}	$K^+ K_S^0 \pi^+ \pi^-$		(9.6 ± 1.3) $\times 10^{-3}$
Γ_{47}	$K^+ K^- 2\pi^+ \pi^-$		(8.8 ± 1.6) $\times 10^{-3}$
Γ_{48}	$\phi 2\pi^+ \pi^-$	[d]	(1.21 ± 0.16) %
Γ_{49}	$K^+ K^- \rho^0 \pi^+ \text{non-}\phi$	<	2.6×10^{-4}
Γ_{50}	$\phi \rho^0 \pi^+, \phi \rightarrow K^+ K^-$		(6.6 ± 1.3) $\times 10^{-3}$
Γ_{51}	$\phi a_1(1260)^+, \phi \rightarrow K^+ K^-, a_1^+ \rightarrow \rho^0 \pi^+$		(7.5 ± 1.3) $\times 10^{-3}$
Γ_{52}	$K^+ K^- 2\pi^+ \pi^- \text{nonresonant}$		(9 ± 7) $\times 10^{-4}$
Γ_{53}	$2K_S^0 2\pi^+ \pi^-$		(8.3 ± 3.5) $\times 10^{-4}$

Hadronic modes without K 's

Γ_{54}	$\pi^+ \pi^0$	$< 3.4 \times 10^{-4}$	CL=90%	NODE=S034;CLUMP=B DESIG=119
Γ_{55}	$2\pi^+ \pi^-$	(1.10 ± 0.06) %		DESIG=15
Γ_{56}	$\rho^0 \pi^+$	(2.0 ± 1.2) $\times 10^{-4}$		DESIG=10
Γ_{57}	$\pi^+(\pi^+\pi^-)_{S\text{-wave}}$	[h] (9.2 ± 0.6) $\times 10^{-3}$		DESIG=113
Γ_{58}	$f_0(980)\pi^+, f_0 \rightarrow \pi^+ \pi^-$			DESIG=14
Γ_{59}	$f_0(1370)\pi^+, f_0 \rightarrow \pi^+ \pi^-$			DESIG=102
Γ_{60}	$f_0(1500)\pi^+, f_0 \rightarrow \pi^+ \pi^-$			DESIG=91
Γ_{61}	$f_2(1270)\pi^+, f_2 \rightarrow \pi^+ \pi^-$	(1.11 ± 0.20) $\times 10^{-3}$		DESIG=90
Γ_{62}	$\rho(1450)^0 \pi^+, \rho^0 \rightarrow \pi^+ \pi^-$	(3.0 ± 2.0) $\times 10^{-4}$		DESIG=103
Γ_{63}	$\pi^+ 2\pi^0$	(6.5 ± 1.3) $\times 10^{-3}$		DESIG=149
Γ_{64}	$2\pi^+ \pi^- \pi^0$	—		DESIG=18;OUR EVAL
Γ_{65}	$\eta \pi^+$	[d] (1.83 ± 0.15) %		DESIG=1
Γ_{66}	$\omega \pi^+$	[d] (2.5 ± 0.7) $\times 10^{-3}$		DESIG=19
Γ_{67}	$3\pi^+ 2\pi^-$	(8.0 ± 0.9) $\times 10^{-3}$		DESIG=17
Γ_{68}	$2\pi^+ \pi^- 2\pi^0$	—		DESIG=57;OUR EVAL
Γ_{69}	$\eta \rho^+$	[d] (8.9 ± 0.8) %		DESIG=58
Γ_{70}	$\eta \pi^+ \pi^0$ 3-body	[d] < 5 %	CL=90%	DESIG=64
Γ_{71}	$\omega \pi^+ \pi^0$	[d] (2.8 ± 0.7) %		DESIG=126
Γ_{72}	$3\pi^+ 2\pi^- \pi^0$	(4.9 ± 3.2) %		DESIG=59
Γ_{73}	$\omega 2\pi^+ \pi^-$	[d] (1.6 ± 0.5) %		DESIG=127
Γ_{74}	$\eta'(958) \pi^+$	[c,d] (3.94 ± 0.33) %		DESIG=13
Γ_{75}	$3\pi^+ 2\pi^- 2\pi^0$	—		DESIG=61;OUR EVAL
Γ_{76}	$\omega \eta \pi^+$	[d] < 2.13 %	CL=90%	DESIG=128
Γ_{77}	$\eta'(958) \rho^+$	[c,d] (12.5 ± 2.2) %		DESIG=62
Γ_{78}	$\eta'(958) \pi^+ \pi^0$ 3-body	[d] < 1.8 %	CL=90%	DESIG=65

Modes with one or three K 's

Γ_{79}	$K^+ \pi^0$	(6.2 ± 2.1) $\times 10^{-4}$		NODE=S034;CLUMP=K DESIG=120
Γ_{80}	$K_S^0 \pi^+$	(1.21 ± 0.08) $\times 10^{-3}$		DESIG=23
Γ_{81}	$K^+ \eta$	[d] (1.75 ± 0.35) $\times 10^{-3}$		DESIG=121
Γ_{82}	$K^+ \omega$	[d] < 2.4 $\times 10^{-3}$	CL=90%	DESIG=129
Γ_{83}	$K^+ \eta'(958)$	[d] (1.8 ± 0.6) $\times 10^{-3}$		DESIG=122
Γ_{84}	$K^+ \pi^+ \pi^-$	(6.9 ± 0.5) $\times 10^{-3}$		DESIG=45
Γ_{85}	$K^+ \rho^0$	(2.7 ± 0.5) $\times 10^{-3}$		DESIG=82
Γ_{86}	$K^+ \rho(1450)^0, \rho^0 \rightarrow \pi^+ \pi^-$	(7.3 ± 2.6) $\times 10^{-4}$		DESIG=108
Γ_{87}	$K^*(892)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-$	(1.50 ± 0.26) $\times 10^{-3}$		DESIG=83
Γ_{88}	$K^*(1410)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-$	(1.30 ± 0.31) $\times 10^{-3}$		DESIG=109
Γ_{89}	$K^*(1430)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-$	(5 ± 4) $\times 10^{-4}$		DESIG=110
Γ_{90}	$K^+ \pi^+ \pi^-$ nonresonant	(1.1 ± 0.4) $\times 10^{-3}$		DESIG=111
Γ_{91}	$K^0 \pi^+ \pi^0$	(1.00 ± 0.18) %		DESIG=150
Γ_{92}	$K_S^0 2\pi^+ \pi^-$	(2.9 ± 1.1) $\times 10^{-3}$		DESIG=123
Γ_{93}	$K^+ \omega \pi^0$	[d] < 8.2 $\times 10^{-3}$	CL=90%	DESIG=130
Γ_{94}	$K^+ \omega \pi^+ \pi^-$	[d] < 5.4 $\times 10^{-3}$	CL=90%	DESIG=131
Γ_{95}	$K^+ \omega \eta$	[d] < 7.9 $\times 10^{-3}$	CL=90%	DESIG=132
Γ_{96}	$2K^+ K^-$	(2.20 ± 0.23) $\times 10^{-4}$		DESIG=67
Γ_{97}	$\phi K^+, \phi \rightarrow K^+ K^-$	(9.0 ± 2.1) $\times 10^{-5}$		DESIG=154

Doubly Cabibbo-suppressed modes

Γ_{98}	$2K^+ \pi^-$	(1.28 ± 0.14) $\times 10^{-4}$		NODE=S034;CLUMP=F DESIG=116
Γ_{99}	$K^+ K^*(892)^0, K^{*0} \rightarrow K^+ \pi^-$	(6.0 ± 3.5) $\times 10^{-5}$		DESIG=155

Baryon-antibaryon mode

Γ_{100}	$p\bar{n}$	(1.3 ± 0.4) $\times 10^{-3}$		NODE=S034;CLUMP=G DESIG=124
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**$\Delta C = 1$ weak neutral current (*C1*) modes,
Lepton family number (*LF*), or
Lepton number (*L*) violating modes**

NODE=S034;CLUMP=E

Γ_{101}	$\pi^+ e^+ e^-$	[i] < 1.3	$\times 10^{-5}$	CL=90%	DESIG=93
Γ_{102}	$\pi^+ \phi, \phi \rightarrow e^+ e^-$	[j] (6 \pm 8) < 4	$\times 10^{-6}$		DESIG=152
Γ_{103}	$\pi^+ \mu^+ \mu^-$	[i] < 2.6	$\times 10^{-5}$	CL=90%	DESIG=73
Γ_{104}	$K^+ e^+ e^-$	<i>C1</i> < 3.7	$\times 10^{-6}$	CL=90%	DESIG=94
Γ_{105}	$K^+ \mu^+ \mu^-$	<i>C1</i> < 2.1	$\times 10^{-5}$	CL=90%	DESIG=74
Γ_{106}	$K^*(892)^+ \mu^+ \mu^-$	<i>C1</i> < 1.4	$\times 10^{-3}$	CL=90%	DESIG=75
Γ_{107}	$\pi^+ e^+ \mu^-$	<i>LF</i> < 1.2	$\times 10^{-5}$	CL=90%	DESIG=156
Γ_{108}	$\pi^+ e^- \mu^+$	<i>LF</i> < 2.0	$\times 10^{-5}$	CL=90%	DESIG=157
Γ_{109}	$K^+ e^+ \mu^-$	<i>LF</i> < 1.4	$\times 10^{-5}$	CL=90%	DESIG=158
Γ_{110}	$K^+ e^- \mu^+$	<i>LF</i> < 9.7	$\times 10^{-6}$	CL=90%	DESIG=159
Γ_{111}	$\pi^- 2e^+$	<i>L</i> < 4.1	$\times 10^{-6}$	CL=90%	DESIG=97
Γ_{112}	$\pi^- 2\mu^+$	<i>L</i> < 1.4	$\times 10^{-5}$	CL=90%	DESIG=76
Γ_{113}	$\pi^- e^+ \mu^+$	<i>L</i> < 8.4	$\times 10^{-6}$	CL=90%	DESIG=98
Γ_{114}	$K^- 2e^+$	<i>L</i> < 5.2	$\times 10^{-6}$	CL=90%	DESIG=99
Γ_{115}	$K^- 2\mu^+$	<i>L</i> < 1.3	$\times 10^{-5}$	CL=90%	DESIG=77
Γ_{116}	$K^- e^+ \mu^+$	<i>L</i> < 6.1	$\times 10^{-6}$	CL=90%	DESIG=100
Γ_{117}	$K^*(892)^- 2\mu^+$	<i>L</i> < 1.4	$\times 10^{-3}$	CL=90%	DESIG=78

[a] This is the purely e^+ semileptonic branching fraction: the e^+ fraction from τ^+ decays has been subtracted off. The sum of our (non- τ) e^+ exclusive fractions — an $e^+ \nu_e$ with an $\eta, \eta', \phi, K^0, K^{*0}$, or $f_0(980)$ — is $7.0 \pm 0.4\%$

LINKAGE=SLE

[b] This fraction includes η from η' decays.

LINKAGE=EFR

[c] Two times (to include μ decays) the $\eta' e^+ \nu_e$ branching fraction, plus the $\eta' \pi^+, \eta' \rho^+, \eta' K^+$ fractions, is $(18.6 \pm 2.3)\%$, which considerably exceeds the inclusive η' fraction of $(11.7 \pm 1.8)\%$. Our best guess is that the $\eta' \rho^+$ fraction, $(12.5 \pm 2.2)\%$, is too large.

LINKAGE=INC

[d] This branching fraction includes all the decay modes of the final-state resonance.

LINKAGE=DFR

[e] A test for $u\bar{u}$ or $d\bar{d}$ content in the D_s^+ . Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and $\omega-\phi$ mixing is an unlikely explanation for any fraction above about 2×10^{-4} .

LINKAGE=MAR

[f] The branching fraction for this mode may differ from the sum of the submodes that contribute to it, due to interference effects. See the relevant papers.

LINKAGE=SDQ

[g] We decouple the $D_s^+ \rightarrow \phi \pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \rightarrow \phi \pi^+, \phi \rightarrow K^+ K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \rightarrow K^+ K^- \pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \rightarrow K^+ K^-$ branching fraction 0.491.

LINKAGE=DBF

[h] This is the average of a model-independent and a *K*-matrix parametrization of the $\pi^+ \pi^-$ *S*-wave and is a sum over several f_0 mesons.

LINKAGE=KMP

[i] This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

LINKAGE=FIX

[j] This is *not* a test for the $\Delta C=1$ weak neutral current, but leads to the $\pi^+ \ell^+ \ell^-$ final state.

LINKAGE=NTC

CONSTRAINED FIT INFORMATION

An overall fit to 16 branching ratios uses 17 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 2.4$ for 6 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_{25}	16															
x_{26}	12	2														
x_{31}	0	0	0													
x_{32}	0	0	0	76												
x_{42}	0	0	0	42	48											
x_{44}	0	0	0	51	59	32										
x_{55}	0	0	0	59	74	37	45									
x_{65}	0	0	0	67	51	29	35	40								
x_{66}	0	0	0	11	8	5	6	6	16							
x_{84}	0	0	0	37	45	22	28	33	25	4						
	x_{23}	x_{25}	x_{26}	x_{31}	x_{32}	x_{42}	x_{44}	x_{55}	x_{65}	x_{66}						

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NODE=S034DSB

D_s^+ BRANCHING RATIOS

A number of older, now obsolete results have been omitted. They may be found in earlier editions.

Inclusive modes

$\Gamma(e^+ \text{ semileptonic})/\Gamma_{\text{total}}$ Γ_1/Γ

This is the purely e^+ semileptonic branching fraction: the e^+ fraction from τ^+ decays has been subtracted off. The sum of our (non- τ) e^+ exclusive fractions — an $e^+ \nu_e$ with an η , η' , ϕ , K^0 , K^{*0} , or $f_0(980)$ — is $6.90 \pm 0.4\%$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$6.52 \pm 0.39 \pm 0.15$	536 ± 29	3 ASNER	10 CLEO	$e^+ e^-$ at 3774 MeV

Using the D_s^+ and D^0 lifetimes, ASNER 10 finds that the ratio of the D_s^+ and D^0 semileptonic widths is $0.828 \pm 0.051 \pm 0.025$.

$\Gamma(\pi^+ \text{ anything})/\Gamma_{\text{total}}$ Γ_2/Γ

Events with two π^+ 's count twice, etc. But π^+ 's from $K_S^0 \rightarrow \pi^+ \pi^-$ are not included.

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
$119.3 \pm 1.2 \pm 0.7$	DOBBS	09 CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(\pi^- \text{ anything})/\Gamma_{\text{total}}$ Γ_3/Γ

Events with two π^- 's count twice, etc. But π^- 's from $K_S^0 \rightarrow \pi^+ \pi^-$ are not included.

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
$43.2 \pm 0.9 \pm 0.3$	DOBBS	09 CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(\pi^0 \text{ anything})/\Gamma_{\text{total}}$ Γ_4/Γ

Events with two π^0 's count twice, etc. But π^0 's from $K_S^0 \rightarrow 2\pi^0$ are not included.

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
$123.4 \pm 3.8 \pm 5.3$	DOBBS	09 CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(K^- \text{ anything})/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
$18.7 \pm 0.5 \pm 0.2$	DOBBS	09 CLEO	$e^+ e^-$ at 4170 MeV

NODE=S034220

NODE=S034220

NODE=S034305

NODE=S034R28

NODE=S034R28

NODE=S034R28

NODE=S034R28;LINKAGE=AS

NODE=S034S32

NODE=S034S32

NODE=S034S32

NODE=S034S33

NODE=S034S33

NODE=S034S33

NODE=S034S34

NODE=S034S34

NODE=S034S34

NODE=S034R34

NODE=S034R34

$\Gamma(K^+ \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$28.9 \pm 0.6 \pm 0.3$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_6/Γ NODE=S034R35
NODE=S034R35 $\Gamma(K_S^0 \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$19.0 \pm 1.0 \pm 0.4$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_7/Γ NODE=S034S37
NODE=S034S37 $\Gamma(\eta \text{anything})/\Gamma_{\text{total}}$ This ratio includes η particles from η' decays.VALUE (units 10^{-2}) **$29.9 \pm 2.2 \pm 1.7$**

EVTS	DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV	

 Γ_8/Γ NODE=S034R02
NODE=S034R02
NODE=S034R02 $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$ 23.5 \pm 3.1 \pm 2.0 674 \pm 91 HUANG 06B CLEO See DOBBS 09 $\Gamma(\omega \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$6.1 \pm 1.4 \pm 0.3$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_9/Γ NODE=S034S35
NODE=S034S35 $\Gamma(\eta' \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$11.7 \pm 1.7 \pm 0.7$**

EVTS	DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV	

 Γ_{10}/Γ NODE=S034R03
NODE=S034R03 $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$ 8.7 \pm 1.9 \pm 0.8 68 \pm 15 HUANG 06B CLEO See DOBBS 09 $\Gamma(f_0(980) \text{anything}, f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-2})**<1.3**

CL%	DOCUMENT ID	TECN	COMMENT
90	DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{11}/Γ NODE=S034S36
NODE=S034S36 $\Gamma(\phi \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$15.7 \pm 0.8 \pm 0.6$**

EVTS	DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV	

 Γ_{12}/Γ NODE=S034R84
NODE=S034R84 $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$ 16.1 \pm 1.2 \pm 1.1 398 \pm 27 HUANG 06B CLEO See DOBBS 09 $\Gamma(K^+ K^- \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$15.8 \pm 0.6 \pm 0.3$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{13}/Γ NODE=S034S38
NODE=S034S38 $\Gamma(K_S^0 K^+ \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$5.8 \pm 0.5 \pm 0.1$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{14}/Γ NODE=S034S39
NODE=S034S39 $\Gamma(K_S^0 K^- \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$1.9 \pm 0.4 \pm 0.1$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{15}/Γ NODE=S034S40
NODE=S034S40 $\Gamma(2K_S^0 \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2}) **$1.7 \pm 0.3 \pm 0.1$**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{16}/Γ NODE=S034S41
NODE=S034S41 $\Gamma(2K^+ \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2})**<0.26**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{17}/Γ NODE=S034S42
NODE=S034S42 $\Gamma(2K^- \text{anything})/\Gamma_{\text{total}}$ VALUE (units 10^{-2})**<0.06**

DOCUMENT ID	TECN	COMMENT
DOBBS 09	CLEO	$e^+ e^-$ at 4170 MeV

 Γ_{18}/Γ NODE=S034S43
NODE=S034S43

Leptonic and semileptonic modes

A REVIEW GOES HERE – Check our WWW List of Reviews

$\Gamma(e^+\nu_e)/\Gamma_{\text{total}}$				Γ_{19}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.2 \times 10^{-4}$	90	ALEXANDER 09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.3 \times 10^{-4}$	90	DEL-AMO-SA..10J	BABR	e^+e^- , 10.58 GeV
$<1.3 \times 10^{-4}$	90	PEDLAR	07A	CLEO See ALEXANDER 09

$\Gamma(\mu^+\nu_\mu)/\Gamma_{\text{total}}$				Γ_{20}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
5.90±0.33 OUR AVERAGE				
6.02±0.38±0.34	275 ± 17	4 DEL-AMO-SA..10J	BABR	e^+e^- , 10.58 GeV
5.65±0.45±0.17	235 ± 14	ALEXANDER 09	CLEO	e^+e^- at 4170 MeV
6.44±0.76±0.57	169 ± 18	5 WIDHALM 08	BELL	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.94±0.66±0.31	88	6 PEDLAR	07A	CLEO See ALEXANDER 09
6.8 ± 1.1 ± 1.8	553	7 HEISTER	02I	ALEP Z decays
4 DEL-AMO-SANCHEZ 10J uses $\mu^+\nu_\mu$ and $\tau^+\nu_\tau$ events together to get $f_{D_s} = (258.6 \pm 6.4 \pm 7.5)$ MeV.				
5 WIDHALM 08 gets $f_{D_s} = (275 \pm 16 \pm 12)$ MeV from the branching fraction.				
6 PEDLAR 07A also fits μ^+ and τ^+ events together and gets an effective $\mu^+\nu_\mu$ branching fraction of $(6.38 \pm 0.59 \pm 0.33) \times 10^{-3}$				
7 This HEISTER 02I result is not actually an independent measurement of the absolute $\mu^+\nu_\mu$ branching fraction, but is in fact based on our $\phi\pi^+$ branching fraction of $3.6 \pm 0.9\%$, so it cannot be included in our overall fit. HEISTER 02I combines its $D_s^+ \rightarrow \tau^+\nu_\tau$ and $\mu^+\nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40)$ MeV.				

$\Gamma(\mu^+\nu_\mu)/\Gamma(\phi\pi^+)$				Γ_{20}/Γ_{33}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
See the note on "Decay Constants of Charged Pseudoscalar Mesons" above.				
0.143±0.018±0.006	489 ± 55	8 AUBERT	07V	BABR $e^+e^- \approx \Upsilon(4S)$
0.23 ± 0.06 ± 0.04	18	9 ALEXANDROV 00	BEAT	π^- nucleus, 350 GeV
0.173±0.023±0.035	182	10 CHADHA	98 CLE2	$e^+e^- \approx \Upsilon(4S)$
0.245±0.052±0.074	39	11 ACOSTA	94 CLE2	See CHADHA 98
8 AUBERT 07V gets $f_{D_s^+} = (283 \pm 17 \pm 16)$ MeV, using $\Gamma(D_s^+ \rightarrow \phi\pi^+)/\Gamma(\text{total}) = (4.71 \pm 0.46)\%$.				
9 ALEXANDROV 00 uses $f_D^2/f_{D_s}^2 = 0.82 \pm 0.09$ from a lattice-gauge-theory calculation to get the relative numbers of $D^+ \rightarrow \mu^+\nu_\mu$ and $D_s^+ \rightarrow \mu^+\nu_\mu$ events. The present result leads to $f_{D_s} = (323 \pm 44 \pm 36)$ MeV.				
10 CHADHA 98 obtains $f_{D_s} = (280 \pm 19 \pm 28 \pm 34)$ MeV from this measurement, using $\Gamma(D_s^+ \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.036 \pm 0.009$.				
11 ACOSTA 94 obtains $f_{D_s} = (344 \pm 37 \pm 52 \pm 42)$ MeV from this measurement, using $\Gamma(D_s^+ \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.037 \pm 0.009$.				

$\Gamma(\tau^+\nu_\tau)/\Gamma_{\text{total}}$				Γ_{21}/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.43±0.31 OUR AVERAGE				
5.00±0.35±0.49	748 ± 53	12 DEL-AMO-SA..10J	BABR	$e^-\bar{\nu}_e\nu_\tau, \mu^-\bar{\nu}_\mu\nu_\tau$
6.42±0.81±0.18	126 ± 16	13 ALEXANDER 09	CLEO	$\tau^+ \rightarrow \pi^+\bar{\nu}_\tau$
5.52±0.57±0.21	155 ± 17	13 NAIK	09A CLEO	$\tau^+ \rightarrow \rho^+\bar{\nu}_\tau$
5.30±0.47±0.22	181 ± 16	13 ONYISI	09 CLEO	$\tau^+ \rightarrow e^+\bar{\nu}_e\bar{\nu}_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.17±0.71±0.34	102	14 ECKLUND	08 CLEO	See ONYISI 09
8.0 ± 1.3 ± 0.4	47	14 PEDLAR	07A CLEO	See ALEXANDER 09
5.79±0.77±1.84	881	15 HEISTER	02I ALEP	Z decays
7.0 ± 2.1 ± 2.0	22	16 ABBIENDI	01L OPAL	$D_s^{*+} \rightarrow \gamma D_s^+$ from Z 's
7.4 ± 2.8 ± 2.4	16	17 ACCIARRI	97F L3	$D_s^{*+} \rightarrow \gamma D_s^+$ from Z 's

NODE=S034310

NODE=S034310

NODE=S034R04

NODE=S034R04

NODE=S034R7

NODE=S034R7

NODE=S034R7

NODE=S034R7;LINKAGE=DE

NODE=S034R7;LINKAGE=WI

NODE=S034R7;LINKAGE=PE

NODE=S034R7;LINKAGE=BQ

NODE=S034R50

NODE=S034R50

NODE=S034R50

NODE=S034R50;LINKAGE=AU

NODE=S034R50;LINKAGE=C

NODE=S034R50;LINKAGE=B

NODE=S034R50;LINKAGE=A

NODE=S034R76

NODE=S034R76

NODE=S034R76

- 12 DEL-AMO-SANCHEZ 10J uses $\mu^+ \nu_\mu$ and $\tau^+ \nu_\tau$ events together to get $f_{D_s} = (258.6 \pm 6.4 \pm 7.5)$ MeV.
- 13 ALEXANDER 09, NAIK 09A, and ONYISI 09 use different τ decay modes and are independent. The three papers combined give $f_{D_s} = (259.7 \pm 7.8 \pm 3.4)$ MeV.
- 14 ECKLUND 08 and PEDLAR 07A are independent: ECKLUND 08 uses $\tau^+ \rightarrow e^+ \nu_e \bar{\nu}_\tau$ events, PEDLAR 07A uses $\tau^+ \rightarrow \pi^+ \bar{\nu}_\tau$ events.
- 15 HEISTER 02I combines its $D_s^+ \rightarrow \tau^+ \nu_\tau$ and $\mu^+ \nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40)$ MeV.
- 16 This ABBIENDI 01L value gives a decay constant f_{D_s} of $(286 \pm 44 \pm 41)$ MeV.
- 17 The second ACCIARRI 97F error here combines in quadrature systematic (0.016) and normalization (0.018) errors. The branching fraction gives $f_{D_s} = (309 \pm 58 \pm 33 \pm 38)$ MeV.

 $\Gamma(\tau^+ \nu_\tau)/\Gamma(\mu^+ \nu_\mu)$ Γ_{21}/Γ_{20}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$11.0 \pm 1.4 \pm 0.6$ 102 18 ECKLUND 08 CLEO See ONYISI 09

18 This ECKLUND 08 value also uses results from PEDLAR 07A, and it is not independent of other results in these Listings. Combined with earlier CLEO results, the decay constant f_{D_s} is $274 \pm 10 \pm 5$ MeV.

 $\Gamma(K^+ K^- e^+ \nu_e)/\Gamma(K^+ K^- \pi^+)$ Γ_{22}/Γ_{32}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.558 \pm 0.007 \pm 0.016$ 19 AUBERT 08AN BABR $e^+ e^-$ at $\gamma(4S)$

19 This AUBERT 08AN ratio is only for the $K^+ K^-$ mass in the range 1.01-to-1.03 GeV in the numerator and 1.0095-to-1.0295 GeV in the denominator.

 $\Gamma(\phi e^+ \nu_e)/\Gamma_{\text{total}}$ Γ_{23}/Γ

See the end of the D_s^+ Listings for measurements of $D_s^+ \rightarrow \phi e^+ \nu_e$ form factors. Unseen decay modes of the ϕ are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.49 ± 0.14 OUR FIT

2.54 ± 0.14 OUR AVERAGE

$2.36 \pm 0.23 \pm 0.13$ 106 ± 10 ECKLUND 09 CLEO $e^+ e^-$ at 4170 MeV
 $2.61 \pm 0.03 \pm 0.17$ (25 ± 0.5)k AUBERT 08AN BABR $e^+ e^-$ at $\gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$2.29 \pm 0.37 \pm 0.11$ 45 YELTON 09 CLEO See ECKLUND 09

 $\Gamma(\phi e^+ \nu_e)/\Gamma(\phi \pi^+)$ Γ_{23}/Γ_{33}

As noted in the comment column, most of these measurements use $\phi \mu^+ \nu_\mu$ events in addition to or instead of $\phi e^+ \nu_e$ events.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.540 \pm 0.033 \pm 0.048$	793	LINK	02J FOCS	Uses $\phi \mu^+ \nu_\mu$
$0.54 \pm 0.05 \pm 0.04$	367	BUTLER	94 CLE2	Uses $\phi e^+ \nu_e$ and $\phi \mu^+ \nu_\mu$
$0.58 \pm 0.17 \pm 0.07$	97	FRABETTI	93G E687	Uses $\phi \mu^+ \nu_\mu$
$0.57 \pm 0.15 \pm 0.15$	104	ALBRECHT	91 ARG	Uses $\phi e^+ \nu_e$
$0.49 \pm 0.10 \pm 0.10$	54	ALEXANDER	90B CLEO	Uses $\phi e^+ \nu_e$ and $\phi \mu^+ \nu_\mu$

 $\Gamma(\eta e^+ \nu_e)/\Gamma_{\text{total}}$ Γ_{25}/Γ

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.67 ± 0.29 OUR FIT Error includes scale factor of 1.1.

2.48 ± 0.29 ± 0.13 82 YELTON 09 CLEO $e^+ e^-$ at 4170 MeV

 $\Gamma(\eta e^+ \nu_e)/\Gamma(\phi e^+ \nu_e)$ Γ_{25}/Γ_{23}

Unseen decay modes of the η and the ϕ are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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1.07 ± 0.12 OUR FIT Error includes scale factor of 1.1.

1.24 ± 0.12 ± 0.15 440 20 BRANDENB... 95 CLE2 $e^+ e^- \approx \gamma(4S)$

20 BRANDENBURG 95 uses both e^+ and μ^+ events and makes a phase-space adjustment to use the μ^+ events as e^+ events.

NODE=S034R76;LINKAGE=DE

NODE=S034R76;LINKAGE=ON

NODE=S034R76;LINKAGE=EC

NODE=S034R76;LINKAGE=BQ

NODE=S034R76;LINKAGE=B

NODE=S034R76;LINKAGE=A

NODE=S034S20

NODE=S034S20

NODE=S034S20;LINKAGE=EU

NODE=S034S23

NODE=S034S23

NODE=S034S23;LINKAGE=AU

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NODE=S034R29

NODE=S034R29

NODE=S034R29

NODE=S034S44

NODE=S034S44

NODE=S034S44

NODE=S034R71

NODE=S034R71

NODE=S034R71

NODE=S034R71;LINKAGE=A

$\Gamma(\eta'(958)e^+\nu_e)/\Gamma_{\text{total}}$ Unseen decay modes of the $\eta'(958)$ are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.99±0.23 OUR FIT				
0.91±0.33±0.05	7.5	YELTON	09	CLEO e^+e^- at 4170 MeV

 Γ_{26}/Γ

NODE=S034S45

NODE=S034S45

NODE=S034S45

 $\Gamma(\eta'(958)e^+\nu_e)/\Gamma(\phi e^+\nu_e)$ Γ_{26}/Γ_{23}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.40±0.09 OUR FIT				
0.43±0.11±0.07	29	21 BRANDENB...	95	CLE2 $e^+e^- \approx \gamma(4S)$

21 BRANDENBURG 95 uses both e^+ and μ^+ events and makes a phase-space adjustment to use the μ^+ events as e^+ events. $[\Gamma(\eta e^+\nu_e) + \Gamma(\eta'(958)e^+\nu_e)]/\Gamma(\phi e^+\nu_e)$ $\Gamma_{24}/\Gamma_{23} = (\Gamma_{25} + \Gamma_{26})/\Gamma_{23}$

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

1.67±0.17±0.17	22 BRANDENB...	95	CLE2	$e^+e^- \approx \gamma(4S)$
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22 This BRANDENBURG 95 data is redundant with data in previous blocks.

 $\Gamma(\omega e^+\nu_e)/\Gamma_{\text{total}}$ Γ_{27}/Γ A test for $u\bar{u}$ or $d\bar{d}$ content in the D_s^+ . Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and $\omega - \phi$ mixing is an unlikely explanation for any fraction above about 2×10^{-4} .

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
<0.20	90	MARTIN	11	CLEO e^+e^- at 4170 MeV

 $\Gamma(K^0 e^+\nu_e)/\Gamma_{\text{total}}$ Γ_{28}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.37±0.10±0.02	14	YELTON	09	CLEO e^+e^- at 4170 MeV

 $\Gamma(K^*(892)^0 e^+\nu_e)/\Gamma_{\text{total}}$ Γ_{29}/Γ Unseen decay modes of the $K^*(892)^0$ are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.18±0.07±0.01	7.5	YELTON	09	CLEO e^+e^- at 4170 MeV

 $\Gamma(f_0(980)e^+\nu_e, f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{30}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.20±0.03±0.01	44 ± 7	ECKLUND	09	CLEO e^+e^- at 4170 MeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.13±0.04±0.01	13	YELTON	09	CLEO See ECKLUND 09
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Hadronic modes with a $K\bar{K}$ pair.

 $\Gamma(K^+ K_S^0)/\Gamma_{\text{total}}$ Γ_{31}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.48±0.08 OUR FIT				
1.49±0.07±0.05		23 ALEXANDER	08	CLEO e^+e^- at 4.17 GeV

23 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

 $\Gamma(K^+ K^- \pi^+)/\Gamma_{\text{total}}$ Γ_{32}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.49±0.27 OUR FIT				
5.50±0.23±0.16	24 ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

24 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

NODE=S034S45

NODE=S034S45

NODE=S034S45

NODE=S034R72

NODE=S034R72

NODE=S034R72

NODE=S034R49

NODE=S034R49

NODE=S034R49

NODE=S034R49;LINKAGE=C

NODE=S034S59

NODE=S034S59

NODE=S034S59

NODE=S034S46

NODE=S034S46

NODE=S034S47

NODE=S034S47

NODE=S034S47

NODE=S034S48

NODE=S034S48

NODE=S034315

NODE=S034S01

NODE=S034S01

NODE=S034S01;LINKAGE=AL

NODE=S034S02

NODE=S034S02

NODE=S034S02;LINKAGE=AL

$\Gamma(\phi\pi^+)/\Gamma_{\text{total}}$

The results here are model-independent. For earlier, model-dependent results, see our PDG 06 edition. We decouple the $D_s^+ \rightarrow \phi\pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \rightarrow \phi\pi^+, \phi \rightarrow K^+K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \rightarrow K^+K^-\pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \rightarrow K^+K^-$ branching fraction 0.491.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
4.5 ±0.4 OUR AVERAGE				
4.62±0.36±0.51	25	AUBERT	06N BABR	e^+e^- at $\Upsilon(4S)$
4.81±0.52±0.38	212 ± 19	26 AUBERT	05V BABR	$e^+e^- \approx \Upsilon(4S)$
3.59±0.77±0.48		27 ARTUSO	96 CLE2	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.9 ± 5.1 ± 1.8	28	BAI	95C BES	e^+e^- 4.03 GeV

- 25 This AUBERT 06N measurement uses $\bar{B}^0 \rightarrow D_s^{(*)-}D_s^{(*)+}$ and $B^- \rightarrow D_s^{(*)-}D_s^{(*)0}$ decays, including some from other papers. However, the result is independent of AUBERT 05V.
- 26 AUBERT 05V uses the ratio of $B^0 \rightarrow D^{*-}D_s^{*+}$ events seen in two different ways, in both of which the $D^{*-} \rightarrow \bar{D}^0\pi^-$ decay is fully reconstructed: (1) The $D_s^{*+} \rightarrow D_s^+\gamma$, $D_s^+ \rightarrow \phi\pi^+$ decay is fully reconstructed. (2) The number of events in the D_s^+ peak in the missing mass spectrum against the $D^{*-}\gamma$ is measured.
- 27 ARTUSO 96 uses partially reconstructed $\bar{B}^0 \rightarrow D^{*+}D_s^{*-}$ decays to get a model-independent value for $\Gamma(D_s^- \rightarrow \phi\pi^-)/\Gamma(D^0 \rightarrow K^-\pi^+)$ of $0.92 \pm 0.20 \pm 0.11$.
- 28 BAI 95C uses $e^+e^- \rightarrow D_s^+D_s^-$ events in which one or both of the D_s^\pm are observed to obtain the first model-independent measurement of the $D_s^+ \rightarrow \phi\pi^+$ branching fraction, without assumptions about $\sigma(D_s^\pm)$. However, with only two “doubly-tagged” events, the statistical error is very large.

 $\Gamma(\phi\pi^+, \phi \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{34}/Γ_{32}

This is the “fit fraction” from the Dalitz-plot analysis. We decouple the $D_s^+ \rightarrow \phi\pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \rightarrow \phi\pi^+, \phi \rightarrow K^+K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \rightarrow K^+K^-\pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \rightarrow K^+K^-$ branching fraction 0.491.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
41.6±0.8 OUR AVERAGE			
41.4±0.8±0.5	DEL-AMO-SA..11G BABR	Dalitz fit, 96k±369 evts	
42.2±1.6±0.3	MITCHELL 09A CLEO	Dalitz fit, 12k evts	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
39.6±3.3±4.7	FRABETTI 95B E687	Dalitz fit, 701 evts	

 $\Gamma(K^+\bar{K}^*(892)^0, \bar{K}^* \rightarrow K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ Γ_{35}/Γ_{32}

This is the “fit fraction” from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
47.8±0.6 OUR AVERAGE			
47.9±0.5±0.5	DEL-AMO-SA..11G BABR	Dalitz fit, 96k±369 evts	
47.4±1.5±0.4	MITCHELL 09A CLEO	Dalitz fit, 12k evts	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
47.8±4.6±4.0	FRABETTI 95B E687	Dalitz fit, 701 evts	

 $\Gamma(f_0(980)\pi^+, f_0 \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{36}/Γ_{32}

This is the “fit fraction” from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
21 ±6 OUR AVERAGE Error includes scale factor of 3.5.			
16.4±0.7±2.0	DEL-AMO-SA..11G BABR	Dalitz fit, 96k±369 evts	
28.2±1.9±1.8	MITCHELL 09A CLEO	Dalitz fit, 12k evts	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
11.0±3.5±2.6	FRABETTI 95B E687	Dalitz fit, 701 evts	

NODE=S034R6

NODE=S034R6

NODE=S034R6

NODE=S034R6;LINKAGE=AE

NODE=S034R6;LINKAGE=AU

NODE=S034R6;LINKAGE=G

NODE=S034R6;LINKAGE=F

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NODE=S034R63

NODE=S034R63

NODE=S034R64

NODE=S034R64

NODE=S034R64

NODE=S034R65

NODE=S034R65

NODE=S034R65

$\Gamma(f_0(1370)\pi^+, f_0 \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{37}/Γ_{32}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
1.3±0.8 OUR AVERAGE	Error includes scale factor of 3.9.		
1.1±0.1±0.2	DEL-AMO-SA..11G	BABR	Dalitz fit, 96k±369 evts
4.3±0.6±0.5	MITCHELL 09A	CLEO	Dalitz fit, 12k evts

 $\Gamma(f_0(1710)\pi^+, f_0 \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{38}/Γ_{32}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
1.2±0.5 OUR AVERAGE	Error includes scale factor of 3.8.		
1.1±0.1±0.1	DEL-AMO-SA..11G	BABR	Dalitz fit, 96k±369 evts
3.4±0.5±0.3	MITCHELL 09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •			
3.4±2.3±3.5	FRAZETTI 95B	E687	Dalitz fit, 701 evts

 $\Gamma(K^+\bar{K}_0^*(1430)^0, \bar{K}_0^* \rightarrow K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ Γ_{39}/Γ_{32}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
3.4±0.7 OUR AVERAGE	Error includes scale factor of 1.2.		
2.4±0.3±1.0	DEL-AMO-SA..11G	BABR	Dalitz fit, 96k±369 evts
3.9±0.5±0.5	MITCHELL 09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •			
9.3±3.2±3.2	FRAZETTI 95B	E687	Dalitz fit, 701 evts

 $\Gamma(K^*(892)^+ \bar{K}^0)/\Gamma(\phi\pi^+)$ Γ_{41}/Γ_{33}

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID	TECN	COMMENT
1.20±0.21±0.13	CHEN 89	CLEO	e^+e^- 10 GeV

 $\Gamma(K^+K^-\pi^+\pi^0)/\Gamma_{\text{total}}$ Γ_{42}/Γ

5.6 ± 0.5 OUR FIT

5.65±0.29±0.4029 ALEXANDER 08 CLEO e^+e^- at 4.17 GeV

29 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

 $\Gamma(\phi\rho^+)/\Gamma(\phi\pi^+)$ Γ_{43}/Γ_{33}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.86±0.26±0.29	253	AVERY 92	CLE2	e^+e^- ≈ 10.5 GeV

 $\Gamma(K_S^0 K^- 2\pi^+)/\Gamma_{\text{total}}$ Γ_{44}/Γ

1.64±0.12 OUR FIT

1.64±0.10±0.0730 ALEXANDER 08 CLEO e^+e^- at 4.17 GeV

30 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

 $\Gamma(K^*(892)^+ \bar{K}^*(892)^0)/\Gamma(\phi\pi^+)$ Γ_{45}/Γ_{33}

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID	TECN	COMMENT
1.6±0.4±0.4	ALBRECHT 92B	ARG	e^+e^- ≈ 10.4 GeV

 $\Gamma(K^+K_S^0\pi^+\pi^-)/\Gamma(K_S^0 K^- 2\pi^+)$ Γ_{46}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.586±0.052±0.043	476	LINK 01c	FOCS	γ nucleus, \bar{E}_γ ≈ 180 GeV

 $\Gamma(K^+K^-2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ Γ_{47}/Γ_{32}

0.160±0.027 OUR AVERAGE

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.150±0.019±0.025	240	LINK 03D	FOCS	γ A, \bar{E}_γ ≈ 180 GeV
0.188±0.036±0.040	75	FRABETTI 97C	E687	γ Be, \bar{E}_γ ≈ 200 GeV

NODE=S034S49

NODE=S034S49

NODE=S034S49

NODE=S034R66

NODE=S034R66

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NODE=S034R67

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NODE=S034S15;LINKAGE=AL

NODE=S034R38

NODE=S034R38

NODE=S034R38

NODE=S034R97

NODE=S034R97

NODE=S034R78

NODE=S034R78

$\Gamma(\phi 2\pi^+ \pi^-)/\Gamma(\phi \pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{48}/Γ_{33}
0.269±0.027 OUR AVERAGE					
0.249±0.024±0.021	136	LINK	03D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$
0.28 ± 0.06 ± 0.01	40	FRABETTI	97C	E687	$\gamma Be, \bar{E}_\gamma \approx 200 \text{ GeV}$
0.58 ± 0.21 ± 0.10	21	FRABETTI	92	E687	γBe
0.42 ± 0.13 ± 0.07	19	ANJOS	88	E691	Photoproduction
1.11 ± 0.37 ± 0.28	62	ALBRECHT	85D	ARG	$e^+ e^- 10 \text{ GeV}$

 $\Gamma(K^+ K^- \rho^0 \pi^+ \text{non-}\phi)/\Gamma(K^+ K^- 2\pi^+ \pi^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{49}/Γ_{47}
<0.03	90	LINK	03D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$

 $\Gamma(\phi \rho^0 \pi^+, \phi \rightarrow K^+ K^-)/\Gamma(K^+ K^- 2\pi^+ \pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{50}/Γ_{47}
0.75±0.06±0.04	LINK	03D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$

 $\Gamma(\phi a_1(1260)^+, \phi \rightarrow K^+ K^-, a_1^+ \rightarrow \rho^0 \pi^+)/\Gamma(K^+ K^- \pi^+)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{51}/Γ_{32}
0.137±0.019±0.011	LINK	03D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$

 $\Gamma(K^+ K^- 2\pi^+ \pi^- \text{nonresonant})/\Gamma(K^+ K^- 2\pi^+ \pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{52}/Γ_{47}
0.10±0.06±0.05	LINK	03D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$

 $\Gamma(2K_S^0 2\pi^+ \pi^-)/\Gamma(K_S^0 K^- 2\pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{53}/Γ_{44}
0.051±0.015±0.015	37 ± 10	LINK	04D	FOCS	$\gamma A, \bar{E}_\gamma \approx 180 \text{ GeV}$

Pionic modes $\Gamma(\pi^+ \pi^0)/\Gamma(K^+ K_S^0)$

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{54}/Γ_{31}
<2.3	90	MENDEZ	10	CLEO	$e^+ e^- \text{ at } 4170 \text{ MeV}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.1	90	ADAMS	07A	CLEO	See MENDEZ 10
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 $\Gamma(2\pi^+ \pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT	Γ_{55}/Γ
1.10±0.06 OUR FIT				

1.11±0.07±0.04

31 ALEXANDER	08	CLEO	$e^+ e^- \text{ at } 4.17 \text{ GeV}$
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31 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

 $\Gamma(2\pi^+ \pi^-)/\Gamma(K^+ K^- \pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{55}/Γ_{32}
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0.200±0.008 OUR FIT

0.199±0.004±0.009	≈ 10.5k	AUBERT	090	BABR	$e^+ e^- \approx 10.6 \text{ GeV}$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.265±0.041±0.031	98	FRABETTI	97D	E687	$\gamma Be \approx 200 \text{ GeV}$
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 $\Gamma(\rho^0 \pi^+)/\Gamma(2\pi^+ \pi^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{56}/Γ_{55}
0.018±0.005±0.010		AUBERT	090	BABR	Dalitz fit, ≈ 10.5k evts

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
0.058±0.023±0.037	AITALA	01A	E791	Dalitz fit, 848 evts

<0.073	90	FRABETTI	97D	E687	$\gamma Be \approx 200 \text{ GeV}$
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NODE=S034R9

NODE=S034R9

NODE=S034R99

NODE=S034R99

NODE=S034S1

NODE=S034S1

NODE=S034S2

NODE=S034S2

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NODE=S034S16

NODE=S034S16;LINKAGE=AL

NODE=S034R80

NODE=S034R80

NODE=S034R85

NODE=S034R85

$\Gamma(\pi^+(\pi^+\pi^-)S\text{-wave})/\Gamma(2\pi^+\pi^-)$ Γ_{57}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis. See also KLEMP 08, which uses $568 D_s^+ \rightarrow 3\pi$ decays (over 280 background events) from FNAL E791 to study various parametrizations of the decay amplitudes. The emphasis there is more on S -wave $\pi\pi$ decay products — 20 different solutions are given — than on D_s^+ fit fractions.

VALUE	DOCUMENT ID	TECN	COMMENT
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0.833 ± 0.020 OUR AVERAGE

0.830 ± 0.009 ± 0.019	³² AUBERT	090 BABR	Dalitz fit, ≈ 10.5k evts
0.8704 ± 0.0560 ± 0.0438	³³ LINK	04 FOCS	Dalitz fit, 1475 ± 50 evts

³²AUBERT 090 gives the amplitude and phase of the $\pi^+\pi^-$ S -wave in 29 $\pi^+\pi^-$ invariant-mass bins.

³³LINK 04 borrows a K-matrix parametrization from ANISOVICH 03 of the full $\pi\pi$ S -wave isoscalar scattering amplitude to describe the $\pi^+\pi^-$ S -wave component of the $\pi^+\pi^+\pi^-$ state. The fit fraction given above is a sum over five f_0 mesons, the $f_0(980)$, $f_0(1300)$, $f_0(1200\text{--}1600)$, $f_0(1500)$, and $f_0(1750)$. See LINK 04 for details and discussion.

 $\Gamma(f_0(980)\pi^+, f_0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{58}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)S\text{-wave}$ fit fraction.

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.565 ± 0.043 ± 0.047	AITALA	01A E791	Dalitz fit, 848 evts
1.074 ± 0.140 ± 0.043	FRABETTI	97D E687	γ Be ≈ 200 GeV

 $\Gamma(f_0(1370)\pi^+, f_0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{59}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)S\text{-wave}$ fit fraction.

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.324 ± 0.077 ± 0.017	AITALA	01A E791	Dalitz fit, 848 evts
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 $\Gamma(f_0(1500)\pi^+, f_0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{60}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)S\text{-wave}$ fit fraction.

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.274 ± 0.114 ± 0.019	³⁴ FRABETTI	97D E687	γ Be ≈ 200 GeV
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³⁴FRABETTI 97D calls this mode $S(1475)\pi^+$, but finds the mass and width of this $S(1475)$ to be in excellent agreement with those of the $f_0(1500)$.

 $\Gamma(f_2(1270)\pi^+, f_2 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{61}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis.

VALUE	DOCUMENT ID	TECN	COMMENT
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0.101 ± 0.018 OUR AVERAGE

0.101 ± 0.015 ± 0.011	AUBERT	090 BABR	Dalitz fit, ≈ 10.5k evts
0.0974 ± 0.0449 ± 0.0294	LINK	04 FOCS	Dalitz fit, 1475 ± 50 evts

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.197 ± 0.033 ± 0.006	AITALA	01A E791	Dalitz fit, 848 evts
0.123 ± 0.056 ± 0.018	FRABETTI	97D E687	γ Be ≈ 200 GeV

 $\Gamma(\rho(1450)^0\pi^+, \rho^0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{62}/Γ_{55}

This is the “fit fraction” from the Dalitz-plot analysis.

VALUE	DOCUMENT ID	TECN	COMMENT
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0.027 ± 0.018 OUR AVERAGE

0.023 ± 0.008 ± 0.017	AUBERT	090 BABR	Dalitz fit, ≈ 10.5k evts
0.0656 ± 0.0343 ± 0.0440	LINK	04 FOCS	Dalitz fit, 1475 ± 50 evts

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.044 ± 0.021 ± 0.002	AITALA	01A E791	Dalitz fit, 848 evts
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 $\Gamma(\pi^+ 2\pi^0)/\Gamma_{\text{total}}$ Γ_{63}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.65 ± 0.13 ± 0.03	72 ± 16	NAIK	09A CLEO	e^+e^- at 4170 MeV
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NODE=S034S13

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NODE=S034S13

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NODE=S034S13;LINKAGE=LI

NODE=S034R83

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NODE=S034R81

NODE=S034R81

NODE=S034R96

NODE=S034R96

NODE=S034R96

NODE=S034S51

NODE=S034S51

$\Gamma(2\pi^+\pi^-\pi^0)/\Gamma(\phi\pi^+)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{64}/Γ_{33}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.3	90	ANJOS	89E	E691 Photoproduction	

 $\Gamma(\eta\pi^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT	Γ_{65}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.58 \pm 0.11 \pm 0.18$	35 ALEXANDER	08	CLEO	See MENDEZ 10
35 ALEXANDER 08 uses single- and double-tagged events in an overall fit.				

 $\Gamma(\eta\pi^+)/\Gamma(K^+K_S^0)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{65}/Γ_{31}
1.23 ± 0.08 OUR FIT					
1.236 $\pm 0.043 \pm 0.063$	2587 \pm 89	MENDEZ	10	CLEO e^+e^- at 4170 MeV	

 $\Gamma(\eta\pi^+)/\Gamma(\phi\pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{65}/Γ_{33}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.48 \pm 0.03 \pm 0.04$	920	JESSOP	98	CLE2 $e^+e^- \approx \gamma(4S)$	
$0.54 \pm 0.09 \pm 0.06$	165	ALEXANDER	92	CLE2 See JESSOP 98	

 $\Gamma(\omega\pi^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{66}/Γ
0.25 ± 0.07 OUR FIT					
0.21 $\pm 0.09 \pm 0.01$	6 \pm 2.4	GE	09A	CLEO e^+e^- at 4170 MeV	

 $\Gamma(\omega\pi^+)/\Gamma(\eta\pi^+)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{66}/Γ_{65}
0.14 ± 0.04 OUR FIT				
0.16 $\pm 0.04 \pm 0.03$	BALEST	97	CLE2 $e^+e^- \approx \gamma(4S)$	

 $\Gamma(3\pi^+2\pi^-)/\Gamma(K^+K^-\pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{67}/Γ_{32}
0.146 ± 0.014 OUR AVERAGE					
$0.145 \pm 0.011 \pm 0.010$	671	LINK	03D	FOCS $\gamma A, \bar{E}_\gamma \approx 180$ GeV	
$0.158 \pm 0.042 \pm 0.031$	37	FRABETTI	97C	E687 $\gamma Be, \bar{E}_\gamma \approx 200$ GeV	

 $\Gamma(\eta\rho^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{69}/Γ
8.9 $\pm 0.6 \pm 0.5$					
8.9 $\pm 0.6 \pm 0.5$	328 \pm 22	NAIK	09A	CLEO $\eta \rightarrow 2\gamma$	

 $\Gamma(\eta\rho^+)/\Gamma(\phi\pi^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{69}/Γ_{33}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.98 \pm 0.20 \pm 0.39$	447	JESSOP	98	CLE2 $e^+e^- \approx \gamma(4S)$	
$2.86 \pm 0.38^{+0.36}_{-0.38}$	217	AVERY	92	CLE2 See JESSOP 98	

 $\Gamma(\eta\pi^+\pi^0 3\text{-body})/\Gamma(\phi\pi^+)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{70}/Γ_{33}
<1.1					
<1.1	90	JESSOP	98	CLE2 $e^+e^- \approx \gamma(4S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.82	90	36 DAOUDI	92	CLE2 See JESSOP 98	

36 We use the JESSOP 98 limit, even though the DAOUDI 92 limit, from the same experiment but with a much smaller data sample, is more restrictive.

NODE=S034R21
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NODE=S034S17

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NODE=S034R40

NODE=S034R40;LINKAGE=A

$\Gamma(\omega\pi^+\pi^0)/\Gamma_{\text{total}}$ Unseen decay modes of the ω are included.

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.78±0.65±0.25	34 ± 7.9	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 Γ_{71}/Γ

NODE=S034S25
NODE=S034S25
NODE=S034S25

 $\Gamma(3\pi^+ 2\pi^- \pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.049^{+0.033}_{-0.030}	BARLAG	92C	ACCM π^- 230 GeV

 Γ_{72}/Γ

NODE=S034R54
NODE=S034R54

 $\Gamma(\omega 2\pi^+ \pi^-)/\Gamma_{\text{total}}$ Unseen decay modes of the ω are included.

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.58±0.45±0.09	29 ± 8.2	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 Γ_{73}/Γ

NODE=S034S26
NODE=S034S26
NODE=S034S26

 $\Gamma(\eta'(958)\pi^+)/\Gamma_{\text{total}}$ Unseen decay modes of the $\eta'(958)$ are included.

<u>VALUE</u> (units 10^{-2})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$3.77 \pm 0.25 \pm 0.30$ 37 ALEXANDER 08 CLEO See MENDEZ 10

37 ALEXANDER 08 uses single- and double-tagged events in an overall fit.

 Γ_{74}/Γ

NODE=S034S18
NODE=S034S18
NODE=S034S18

 $\Gamma(\eta'(958)\pi^+)/\Gamma(K^+ K_S^0)$ Unseen decay modes of the $\eta'(958)$ are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.654±0.088±0.139	1436 ± 47	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV

 Γ_{74}/Γ_{31}

NODE=S034S57
NODE=S034S57
NODE=S034S57

 $\Gamma(\eta'(958)\pi^+)/\Gamma(\phi\pi^+)$

Unseen decay modes of the resonances are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.03±0.06±0.07	537	JESSOP	98	CLE2 $e^+ e^- \approx \gamma(4S)$
1.20±0.15±0.11	281	ALEXANDER	92	CLE2 See JESSOP 98
$2.5 \pm 1.0 \begin{array}{l} +1.5 \\ -0.4 \end{array}$	22	ALVAREZ	91	NA14 Photoproduction
$2.5 \pm 0.5 \pm 0.3$	215	ALBRECHT	90D	ARG $e^+ e^- \approx 10.4$ GeV

 Γ_{74}/Γ_{33}

NODE=S034R15
NODE=S034R15
NODE=S034R15

 $\Gamma(\omega\eta\pi^+)/\Gamma_{\text{total}}$ Unseen decay modes of the ω and η are included.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.13 × 10⁻²	90	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 Γ_{76}/Γ

NODE=S034S27
NODE=S034S27
NODE=S034S27

 $\Gamma(\eta'(958)\rho^+)/\Gamma(\phi\pi^+)$

Unseen decay modes of the resonances are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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2.78±0.28±0.30 137 JESSOP 98 CLE2 $e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$3.44 \pm 0.62 \begin{array}{l} +0.44 \\ -0.46 \end{array}$ 68 AVERY 92 CLE2 See JESSOP 98

 Γ_{77}/Γ_{33}

NODE=S034R33
NODE=S034R33
NODE=S034R33

 $\Gamma(\eta'(958)\pi^+\pi^0 3\text{-body})/\Gamma(\phi\pi^+)$

Unseen decay modes of the resonances are included.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.4	90	JESSOP	98	CLE2 $e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.85 90 DAOUDI 92 CLE2 See JESSOP 98

 Γ_{78}/Γ_{33}

NODE=S034R41
NODE=S034R41
NODE=S034R41

Modes with one or three K 's

 $\Gamma(K^+\pi^0)/\Gamma(K^+ K_S^0)$ Γ_{79}/Γ_{31}

NODE=S034R06
NODE=S034R06

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.2±1.4±0.2	202 ± 70	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$5.5 \pm 1.3 \pm 0.7$ 141 ± 34 ADAMS 07A CLEO See MENDEZ 10

NODE=S034323

$\Gamma(K_S^0 \pi^+)/\Gamma(K^+ K_S^0)$

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8.12±0.28 OUR AVERAGE				
8.5 ± 0.7 ± 0.2	393 ± 33	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
8.03±0.24±0.19	17.6k±481	WON	09	BELL $e^+ e^-$ at $\gamma(4S)$
10.4 ± 2.4 ± 1.4	113 ± 26	LINK	08	FOCS $\gamma A, \bar{E}_\gamma \approx 180$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
8.2 ± 0.9 ± 0.2	206 ± 22	ADAMS	07A	CLEO See MENDEZ 10

 Γ_{80}/Γ_{31}

NODE=S034R07
NODE=S034R07

 $\Gamma(K^+ \eta)/\Gamma(K^+ K_S^0)$
 Γ_{81}/Γ_{31}

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
11.8±2.2±0.6	222 ± 41	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV

NODE=S034S54
NODE=S034S54
NODE=S034S54

 $\Gamma(K^+ \eta)/\Gamma(\eta \pi^+)$
 Γ_{81}/Γ_{65}

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
8.9±1.5±0.4	113 ± 18	ADAMS	07A	CLEO See MENDEZ 10

NODE=S034R08
NODE=S034R08

 $\Gamma(K^+ \omega)/\Gamma_{\text{total}}$
 Γ_{82}/Γ

<u>VALUE</u> (units 10^{-2})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.24	90	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

NODE=S034S28
NODE=S034S28
NODE=S034S28

 $\Gamma(K^+ \eta'(958))/\Gamma(K^+ K_S^0)$
 Γ_{83}/Γ_{31}

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
11.8±3.6±0.7	56 ± 17	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV

NODE=S034S55
NODE=S034S55
NODE=S034S55

 $\Gamma(K^+ \eta'(958))/\Gamma(\eta'(958) \pi^+)$
 Γ_{83}/Γ_{74}

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.2±1.3±0.3	28 ± 9	ADAMS	07A	CLEO See MENDEZ 10

NODE=S034R09
NODE=S034R09

 $\Gamma(K^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$
 Γ_{84}/Γ

<u>VALUE</u> (units 10^{-2})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.69±0.05 OUR FIT			
0.69±0.05±0.03	38 ALEXANDER	08	CLEO $e^+ e^-$ at 4.17 GeV

NODE=S034S19
NODE=S034S19

 $\Gamma(K^+ \rho(1450)^0, \rho^0 \rightarrow \pi^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$
 Γ_{84}/Γ_{32}

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.126±0.009 OUR FIT				
0.127±0.007±0.014	567 ± 31	LINK	04F	FOCS $\gamma A, \bar{E}_\gamma \approx 180$ GeV

NODE=S034S05
NODE=S034S05

 $\Gamma(K^+ \rho^0)/\Gamma(K^+ \pi^+ \pi^-)$
 Γ_{85}/Γ_{84}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.3883±0.0531±0.0261	LINK	04F	FOCS Dalitz fit, 567 evts

NODE=S034S06
NODE=S034S06
NODE=S034S06

 $\Gamma(K^+ \rho(1450)^0, \rho^0 \rightarrow \pi^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$
 Γ_{86}/Γ_{84}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.1062±0.0351±0.0104	LINK	04F	FOCS Dalitz fit, 567 evts

NODE=S034S07
NODE=S034S07
NODE=S034S07

 $\Gamma(K^*(892)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$
 Γ_{87}/Γ_{84}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.2164±0.0321±0.0114	LINK	04F	FOCS Dalitz fit, 567 evts

NODE=S034S08
NODE=S034S08
NODE=S034S08

 $\Gamma(K^*(1410)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$
 Γ_{88}/Γ_{84}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.1882±0.0403±0.0122	LINK	04F	FOCS Dalitz fit, 567 evts

NODE=S034S09
NODE=S034S09
NODE=S034S09

$\Gamma(K^*(1430)^0 \pi^+, K^{*0} \rightarrow K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$ Γ_{89}/Γ_{84}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID	TECN	COMMENT
0.0765±0.0500±0.0170	LINK	04F	FOCS Dalitz fit, 567 evts

 $\Gamma(K^+ \pi^+ \pi^- \text{ nonresonant})/\Gamma(K^+ \pi^+ \pi^-)$ Γ_{90}/Γ_{84}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID	TECN	COMMENT
0.1588±0.0492±0.0153	LINK	04F	FOCS Dalitz fit, 567 evts

 $\Gamma(K^0 \pi^+ \pi^0)/\Gamma_{\text{total}}$ Γ_{91}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.00±0.18±0.04	44 ± 8	NAIK	09A	CLEO $e^+ e^-$ at 4170 MeV

 $\Gamma(K_S^0 2\pi^+ \pi^-)/\Gamma(K_S^0 K^- 2\pi^+)$ Γ_{92}/Γ_{44}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.18±0.04±0.05	179 ± 36	LINK	08	FOCS $\gamma A, \bar{E}_\gamma \approx 180$ GeV

 $\Gamma(K^+ \omega \pi^0)/\Gamma_{\text{total}}$ Γ_{93}/Γ Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
<0.82	90	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 $\Gamma(K^+ \omega \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{94}/Γ Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
<0.54	90	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 $\Gamma(K^+ \omega \eta)/\Gamma_{\text{total}}$ Γ_{95}/Γ Unseen decay modes of the ω and η are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
<0.79	90	GE	09A	CLEO $e^+ e^-$ at 4170 MeV

 $\Gamma(2K^+ K^-)/\Gamma(K^+ K^- \pi^+)$ Γ_{96}/Γ_{32}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
4.0 ± 0.3 ± 0.2	748 ± 60	DEL-AMO-SA..11G	BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

8.95±2.12 ^{+2.24} _{-2.31}	31	LINK	02I	FOCS γ nucleus, ≈ 180 GeV
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 $\Gamma(\phi K^+, \phi \rightarrow K^+ K^-)/\Gamma(2K^+ K^-)$ Γ_{97}/Γ_{96}

VALUE	DOCUMENT ID	TECN	COMMENT
0.41±0.08±0.03	DEL-AMO-SA..11G	BABR	$e^+ e^- \approx \gamma(4S)$

Doubly Cabibbo-suppressed modes $\Gamma(2K^+ \pi^-)/\Gamma(K^+ K^- \pi^+)$ Γ_{98}/Γ_{32}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.33±0.23 OUR AVERAGE				
2.3 ± 0.3 ± 0.2	356 ± 52	DEL-AMO-SA..11G	BABR	$e^+ e^- \approx \gamma(4S)$
2.29±0.28±0.12	281 ± 34	KO	09	BELL $e^+ e^-$ at $\gamma(4S)$
5.2 ± 1.7 ± 1.1	27 ± 9	LINK	05K	FOCS <0.78%, CL = 90%

 $\Gamma(K^+ K^*(892)^0, K^{*0} \rightarrow K^+ \pi^-)/\Gamma(2K^+ \pi^-)$ Γ_{99}/Γ_{98}

VALUE	DOCUMENT ID	TECN	COMMENT
0.47±0.22±0.15	DEL-AMO-SA..11G	BABR	$e^+ e^- \approx \gamma(4S)$

Baryon-antibaryon mode $\Gamma(p \bar{n})/\Gamma_{\text{total}}$ Γ_{100}/Γ

This is the only baryonic mode allowed kinematically.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.30±0.36^{+0.12}_{-0.16}	13.0 ± 3.6	ATHAR	08	CLEO $e^+ e^-$, $E_{\text{cm}} \approx 4170$ MeV

NODE=S034S10

NODE=S034S10

NODE=S034S10

NODE=S034S11

NODE=S034S11

NODE=S034S11

NODE=S034S52

NODE=S034S52

NODE=S034S04

NODE=S034S04

NODE=S034S29

NODE=S034S29

NODE=S034S29

NODE=S034S30

NODE=S034S30

NODE=S034S30

NODE=S034S31

NODE=S034S31

NODE=S034S31

NODE=S034R98

NODE=S034R98

NODE=S034S60

NODE=S034S60

NODE=S034327

NODE=S034R01

NODE=S034R01

NODE=S034S61

NODE=S034S61

NODE=S034329

NODE=S034S21

NODE=S034S21

NODE=S034S21

Rare or forbidden modes **$\Gamma(\pi^+ e^+ e^-)/\Gamma_{\text{total}}$** **$\Gamma_{101}/\Gamma$**

This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 13 \times 10^{-6}$	90	8 ± 35	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 2.2 \times 10^{-5}$	90	39	RUBIN	10 CLEO	$e^+ e^-$ at 4170 MeV
$< 27 \times 10^{-5}$	90		AITALA	99G E791	$\pi^- N$ 500 GeV

39 This RUBIN 10 limit is for the $e^+ e^-$ mass in the continuum away from the $\phi(1020)$. See the next data block.

 $\Gamma(\pi^+ \phi, \phi \rightarrow e^+ e^-)/\Gamma_{\text{total}}$ **Γ_{102}/Γ**

This is *not* a test for the $\Delta C = 1$ weak neutral current, but leads to the $\pi^+ e^+ e^-$ final state.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$(6^{+8}_{-4} \pm 1) \times 10^{-6}$	3		RUBIN	10 CLEO	$e^+ e^-$ at 4170 MeV

 $\Gamma(\pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{103}/Γ**

This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 2.6 \times 10^{-5}$	90		LINK	03F FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 43 \times 10^{-6}$	90	20 ± 16	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$
$< 1.4 \times 10^{-4}$	90		AITALA	99G E791	$\pi^- N$ 500 GeV
$< 4.3 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV

 $\Gamma(K^+ e^+ e^-)/\Gamma_{\text{total}}$ **Γ_{104}/Γ**

A test for the $\Delta C=1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 3.7 \times 10^{-6}$	90	-5.7 ± 6.1	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 5.2 \times 10^{-5}$	90		RUBIN	10 CLEO	$e^+ e^-$ at 4170 MeV
$< 1.6 \times 10^{-3}$	90		AITALA	99G E791	$\pi^- N$ 500 GeV

 $\Gamma(K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{105}/Γ**

A test for the $\Delta C=1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 21 \times 10^{-6}$	90	4.8 ± 6.0	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 3.6 \times 10^{-5}$	90		LINK	03F FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
$< 1.4 \times 10^{-4}$	90		AITALA	99G E791	$\pi^- N$ 500 GeV
$< 5.9 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV

 $\Gamma(K^*(892)^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{106}/Γ**

A test for the $\Delta C=1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 1.4 \times 10^{-3}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV

 $\Gamma(\pi^+ e^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{107}/Γ**

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 12 \times 10^{-6}$	90	-3 ± 11	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

 $\Gamma(\pi^+ e^- \mu^+)/\Gamma_{\text{total}}$ **Γ_{108}/Γ**

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 20 \times 10^{-6}$	90	9.3 ± 7.8	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

NODE=S034325

NODE=S034R87

NODE=S034R87

NODE=S034R87

NODE=S034R87;LINKAGE=RU

NODE=S034S58

NODE=S034S58

NODE=S034S58

NODE=S034R57

NODE=S034R57

NODE=S034R57

NODE=S034R88

NODE=S034R88

NODE=S034R88

NODE=S034R58

NODE=S034R58

NODE=S034R58

NODE=S034R59

NODE=S034R59

NODE=S034R59

NODE=S034S62

NODE=S034S62

NODE=S034S62

NODE=S034S63

NODE=S034S63

NODE=S034S63

$\Gamma(K^+ e^+ \mu^-)/\Gamma_{\text{total}}$

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 14 \times 10^{-6}$	90	9.1 ± 6.6	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

 Γ_{109}/Γ

NODE=S034S64
NODE=S034S64
NODE=S034S64

 $\Gamma(K^+ e^- \mu^+)/\Gamma_{\text{total}}$

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 9.7 \times 10^{-6}$	90	3.4 ± 7.3	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

 Γ_{110}/Γ

NODE=S034S65
NODE=S034S65
NODE=S034S65

 $\Gamma(\pi^- 2e^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 4.1 \times 10^{-6}$	90	-5.7 ± 14	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 1.8 \times 10^{-5}$	90	RUBIN	10	CLEO	$e^+ e^-$ at 4170 MeV
$< 69 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

 Γ_{111}/Γ

NODE=S034R91
NODE=S034R91
NODE=S034R91

 $\Gamma(\pi^- 2\mu^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 14 \times 10^{-6}$	90	0.6 ± 5.8	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 2.9 \times 10^{-5}$	90	LINK	03F	FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
$< 8.2 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$< 4.3 \times 10^{-4}$	90	0	KODAMA	95	E653 π^- emulsion 600 GeV

 Γ_{112}/Γ

NODE=S034R60
NODE=S034R60
NODE=S034R60

 $\Gamma(\pi^- e^+ \mu^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 8.4 \times 10^{-6}$	90	-0.2 ± 7.9	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 7.3 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
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 Γ_{113}/Γ

NODE=S034R92
NODE=S034R92
NODE=S034R92

 $\Gamma(K^- 2e^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 5.2 \times 10^{-6}$	90	2.3 ± 8.6	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 1.7 \times 10^{-5}$	90	RUBIN	10	CLEO	$e^+ e^-$ at 4170 MeV
$< 63 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

 Γ_{114}/Γ

NODE=S034R93
NODE=S034R93
NODE=S034R93

 $\Gamma(K^- 2\mu^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 1.3 \times 10^{-5}$	90	-2.3 ± 5.7	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$
$< 1.3 \times 10^{-5}$	90	LINK	03F	FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 1.8 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$< 5.9 \times 10^{-4}$	90	0	KODAMA	95	E653 π^- emulsion 600 GeV

 Γ_{115}/Γ

NODE=S034R61
NODE=S034R61
NODE=S034R61;CHECK LIMITS

 $\Gamma(K^- e^+ \mu^+)/\Gamma_{\text{total}}$

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 6.1 \times 10^{-6}$	90	-14 ± 9	LEES	11G BABR	$e^+ e^- \approx \gamma(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 6.8 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
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 Γ_{116}/Γ

NODE=S034R94
NODE=S034R94
NODE=S034R94

$\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{\text{total}}$ Γ_{117}/Γ

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<1.4 \times 10^{-3}$	90	0	KODAMA	95	E653 π^- emulsion 600 GeV

 $D_s^+ - D_s^-$ CP-VIOLATING DECAY-RATE ASYMMETRIESThis is the difference of the D_s^+ and D_s^- partial widths divided by the sum of the widths. $A_{CP}(\mu^\pm \nu)$ in $D_s^+ \rightarrow \mu^+ \nu, D_s^- \rightarrow \mu^- \bar{\nu}_\mu$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+4.8 \pm 6.1$	ALEXANDER 09	CLEO	$e^+ e^-$ at 4170 MeV

 $A_{CP}(K^\pm K_S^0)$ in $D_s^\pm \rightarrow K^\pm K_S^0$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.3 ± 0.4 OUR AVERAGE				

$+0.12 \pm 0.36 \pm 0.22$	KO	10	BELL	$e^+ e^- \approx \gamma(4S)$
$+4.7 \pm 1.8 \pm 0.9$	4.0k	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$+4.9 \pm 2.1 \pm 0.9$		ALEXANDER 08	CLEO	See MENDEZ 10

 $A_{CP}(K^+ K^- \pi^\pm)$ in $D_s^\pm \rightarrow K^+ K^- \pi^\pm$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+0.3 \pm 1.1 \pm 0.8$	ALEXANDER 08	CLEO	$e^+ e^-$ at 4.17 GeV

 $A_{CP}(K^+ K^- \pi^\pm \pi^0)$ in $D_s^\pm \rightarrow K^+ K^- \pi^\pm \pi^0$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$-5.9 \pm 4.2 \pm 1.2$	ALEXANDER 08	CLEO	$e^+ e^-$ at 4.17 GeV

 $A_{CP}(K_S^0 K^\mp 2\pi^\pm)$ in $D_s^+ \rightarrow K_S^0 K^\mp 2\pi^\pm$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$-0.7 \pm 3.6 \pm 1.1$	ALEXANDER 08	CLEO	$e^+ e^-$ at 4.17 GeV

 $A_{CP}(\pi^+ \pi^- \pi^\pm)$ in $D_s^\pm \rightarrow \pi^+ \pi^- \pi^\pm$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+2.0 \pm 4.6 \pm 0.7$	ALEXANDER 08	CLEO	$e^+ e^-$ at 4.17 GeV

 $A_{CP}(\pi^\pm \eta)$ in $D_s^\pm \rightarrow \pi^\pm \eta$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
$-4.6 \pm 2.9 \pm 0.3$	2.5k	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$-8.2 \pm 5.2 \pm 0.8$		ALEXANDER 08	CLEO	See MENDEZ 10

 $A_{CP}(\pi^\pm \eta')$ in $D_s^\pm \rightarrow \pi^\pm \eta'$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
$-6.1 \pm 3.0 \pm 0.3$	1.4k	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$-5.5 \pm 3.7 \pm 1.2$		ALEXANDER 08	CLEO	See MENDEZ 10

 $A_{CP}(K^\pm \pi^0)$ in $D_s^\pm \rightarrow K^\pm \pi^0$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
$-26.6 \pm 23.8 \pm 0.9$	202 ± 70	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$+2 \pm 29$		ADAMS	07A	CLEO See MENDEZ 10

 $A_{CP}(K_S^0 \pi^\pm)$ in $D_s^\pm \rightarrow K_S^0 \pi^\pm$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
6.6 ± 3.3 OUR AVERAGE				Error includes scale factor of 1.4.
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$+5.45 \pm 2.50 \pm 0.33$	KO	10	BELL	$e^+ e^- \approx \gamma(4S)$
$+16.3 \pm 7.3 \pm 0.3$	393 ± 33	MENDEZ	10	CLEO $e^+ e^-$ at 4170 MeV
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$+27 \pm 11$		ADAMS	07A	CLEO See MENDEZ 10

NODE=S034R62

NODE=S034R62

NODE=S034R62

NODE=S034245

NODE=S034245

NODE=S034A13

NODE=S034A13

NODE=S034A05

NODE=S034A05

NODE=S034A06

NODE=S034A06

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NODE=S034A07

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NODE=S034A10

NODE=S034A10

NODE=S034A11

NODE=S034A11

NODE=S034A01

NODE=S034A01

NODE=S034A02

NODE=S034A02

$A_{CP}(K^\pm\pi^+\pi^-)$ in $D_s^\pm \rightarrow K^\pm\pi^+\pi^-$

VALUE (%)		DOCUMENT ID	TECN	COMMENT
+11.2±7.0±0.9		ALEXANDER 08	CLEO	e^+e^- at 4.17 GeV

NODE=S034A12
NODE=S034A12 **$A_{CP}(K^\pm\eta)$ in $D_s^\pm \rightarrow K^\pm\eta$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
+ 9.3±15.2±0.9	222 ± 41	MENDEZ 10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-20 ± 18		ADAMS 07A	CLEO	See MENDEZ 10

NODE=S034A03
NODE=S034A03 **$A_{CP}(K^\pm\eta'(958))$ in $D_s^\pm \rightarrow K^\pm\eta'(958)$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
+ 6.0±18.9±0.9	56 ± 17	MENDEZ 10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-17 ± 37		ADAMS 07A	CLEO	See MENDEZ 10

NODE=S034A04
NODE=S034A04 **$D_s^+ - D_s^-$ T-VIOLATING DECAY-RATE ASYMMETRIES** **$A_{Tviol}(K_S^0 K^\pm\pi^+\pi^-)$ in $D_s^\pm \rightarrow K_S^0 K^\pm\pi^+\pi^-$**

$C_T \equiv \vec{p}_{K^+} \cdot (\vec{p}_{\pi^+} \times \vec{p}_{\pi^-})$ is a T -odd correlation of the K^+ , π^+ , and π^- momenta for the D_s^+ . $\bar{C}_T \equiv \vec{p}_{K^-} \cdot (\vec{p}_{\pi^-} \times \vec{p}_{\pi^+})$ is the corresponding quantity for the D_s^- . $A_T \equiv [\Gamma(C_T > 0) - \Gamma(C_T < 0)] / [\Gamma(C_T > 0) + \Gamma(C_T < 0)]$ would, in the absence of strong phases, test for T violation in D_s^+ decays (the Γ 's are partial widths). With $\bar{A}_T \equiv [\Gamma(-\bar{C}_T > 0) - \Gamma(-\bar{C}_T < 0)] / [\Gamma(-\bar{C}_T > 0) + \Gamma(-\bar{C}_T < 0)]$, the asymmetry $A_{Tviol} \equiv \frac{1}{2}(A_T - \bar{A}_T)$ tests for T violation even with nonzero strong phases.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
-13.6± 7.7± 3.4	29.8±0.3k	LEES 11E	BABR	$e^+e^- \approx \gamma(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-36 ± 67 ± 23	508 ± 34	LINK 05E	FOCS	γA , $\bar{E}_\gamma \approx 180$ GeV

NODE=S034242

NODE=S034TV0
NODE=S034TV0

NODE=S034TV0

 $D_s^+ \rightarrow \phi\ell^+\nu_\ell$ FORM FACTORS **$r_2 \equiv A_2(0)/A_1(0)$ in $D_s^+ \rightarrow \phi\ell^+\nu_\ell$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.84 ± 0.11 OUR AVERAGE		Error includes scale factor of 2.4.		
0.816±0.036±0.030	25±0.5k	40 AUBERT	08AN BABR	$\phi e^+\nu_e$
0.713±0.202±0.284	793	LINK	04C FOCS	$\phi\mu^+\nu_\mu$
1.57 ± 0.25 ± 0.19	271	AITALA	99D E791	$\phi e^+\nu_e, \phi\mu^+\nu_\mu$
1.4 ± 0.5 ± 0.3	308	AVERY	94B CLE2	$\phi e^+\nu_e$
1.1 ± 0.8 ± 0.1	90	FRABETTI	94F E687	$\phi\mu^+\nu_\mu$
2.1 ± 0.6 ± 0.2	19	KODAMA	93 E653	$\phi\mu^+\nu_\mu$

NODE=S034260

NODE=S034FR2
NODE=S034FR2

NODE=S034FR2;LINKAGE=AU

40 To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at $m_A = 2.5$ GeV/ c^2 and $m_V = 2.1$ GeV/ c^2 . A simultaneous fit to r_2 , r_V , r_0 (a significant s-wave contribution) and m_A , gives $r_2 = 0.763 \pm 0.071 \pm 0.065$.

 $r_V \equiv V(0)/A_1(0)$ in $D_s^+ \rightarrow \phi\ell^+\nu_\ell$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.80 ± 0.08 OUR AVERAGE				
1.807±0.046±0.065	25±0.5k	41 AUBERT	08AN BABR	$\phi e^+\nu_e$
1.549±0.250±0.148	793	LINK	04C FOCS	$\phi\mu^+\nu_\mu$
2.27 ± 0.35 ± 0.22	271	AITALA	99D E791	$\phi e^+\nu_e, \phi\mu^+\nu_\mu$
0.9 ± 0.6 ± 0.3	308	AVERY	94B CLE2	$\phi e^+\nu_e$
1.8 ± 0.9 ± 0.2	90	FRABETTI	94F E687	$\phi\mu^+\nu_\mu$
2.3 ± 1.1 ± 0.4	19	KODAMA	93 E653	$\phi\mu^+\nu_\mu$

NODE=S034FRV
NODE=S034FRV

NODE=S034FRV;LINKAGE=AU

41 To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at $m_A = 2.5$ GeV/ c^2 and $m_V = 2.1$ GeV/ c^2 . A simultaneous fit to r_2 , r_V , r_0 (a significant s-wave contribution) and m_A , gives $r_V = 1.849 \pm 0.060 \pm 0.095$.

Γ_L/Γ_T in $D_s^+ \rightarrow \phi\ell^+\nu_\ell$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.72±0.18 OUR AVERAGE				
1.0 ± 0.3 ± 0.2	308	AVERY	94B CLE2	$\phi e^+ \nu_e$
1.0 ± 0.5 ± 0.1	90	42 FRABETTI	94F E687	$\phi \mu^+ \nu_\mu$
0.54±0.21±0.10	19	42 KODAMA	93 E653	$\phi \mu^+ \nu_\mu$

42 FRABETTI 94F and KODAMA 93 evaluate Γ_L/Γ_T for a lepton mass of zero.NODE=S034GLT
NODE=S034GLT D_s^\pm REFERENCES

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LINK 04C	PL B586 183	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)	REFID=49887
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NODE=S034GLT;LINKAGE=BB

NODE=S034

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